

Phase and Kinetic Behavior of Methane and Carbon Dioxide Hydrates: Preliminary Process Data for Recovering Methane from Methane Hydrate Layer

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Large amounts of CH_4 are stored as hydrates on continental margins and permafrost regions. If the CH_4 hydrates could be converted into CO_2 hydrate, they would serve double duty as CH_4 sources and CO_2 storage sites in the deep ocean sediments. As preliminary investigations, both the phase behavior of CH_4 hydrates and kinetic behaviors of CO_2 hydrate were measured at versatile conditions that can simulate actual marine sediments. When measuring three-phase equilibria (H-LW-V) containing CH_4 hydrate, we also closely examined pore and electrolyte effects of clay and NaCl on hydrate formation. These two effects inhibited hydrate nucleation and thus made hydrate equilibrium line shifted to higher pressure region. In addition, the kinetic data of CO_2 hydrate in the mixtures containing clay and NaCl were determined at 2.0 MPa and 274.15 K. Clay mineral accelerated an initial formation rate of CO_2 hydrate by inducing nucleation as initiator, but total amount of formed CO_2 , of course, decreased due to the capillary effect of clay pores.